

**GENERAL  
CATALOG**



**HOKURIKU**



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# Thick Film Hybrid Integrated Circuits

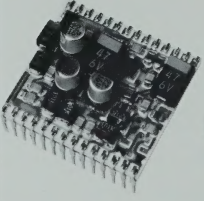
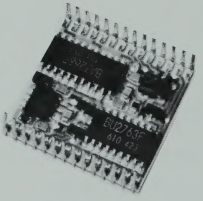
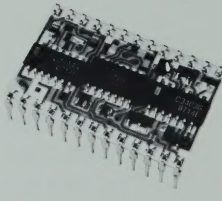
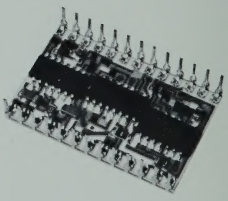
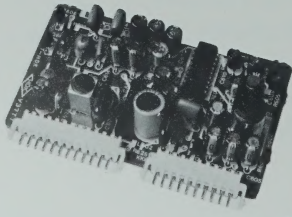
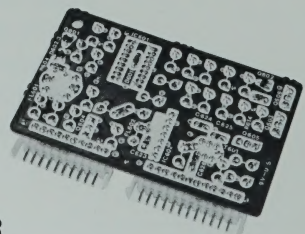
## ● Outline of HDK'S Hybrid IC

### New Leader of the Compound Parts Age!!

Hokuriku Electric Industry Co., Ltd. (HDK) manufactures a wide variety of hybrid integrated circuits, ranging from semiconductor assembling types to the simple resistor network types, using precious metal glazed thick films for high quality and carbon resin thick films for low-priced products.

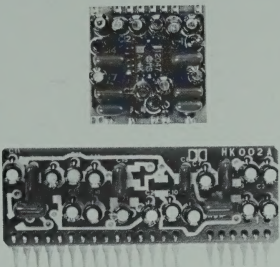
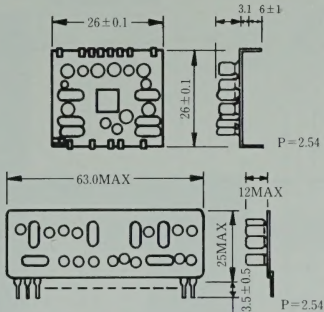
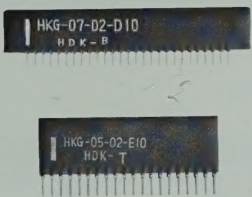
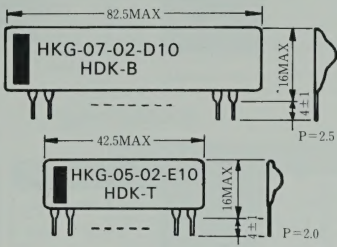
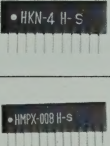
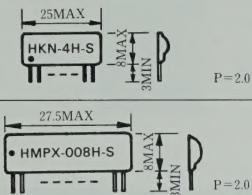
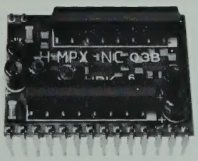
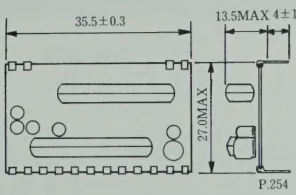

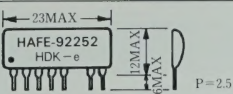
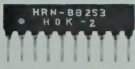
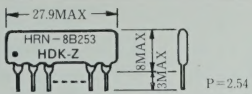

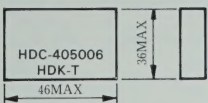
HDK's hybrid IC's, with HDK's superior thick film technique, will fully satisfy all customer requirements for less weight and size, high reliability, high density, and labor saving.

## ● Custom Types

<p><b>HIC</b> (Hybrid IC)</p>	<div> <div>Surface</div> <div>Bottom</div> <div>Surface</div> <div>Bottom</div> </div> <div>     </div> <div> <div>For VTR</div> <div>For OA</div> </div>
<p><b>PHC</b> (Printed-board Hybrid IC)</p>	<div> <div>Surface</div> <div>Bottom</div> </div> <div>   </div> <div>For VTR</div>

## ● Standard Types

UNIT : mm

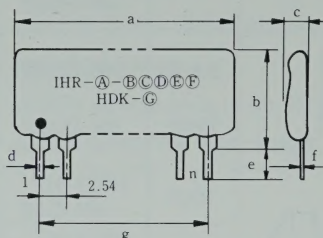
DOLBY			B TYPE	HK-001A
				HK-002A
				HK-005A
				HK-005B
GRAPHIC EQUALIZER			10ch	HKG-10 -01-B10
				HKG-07 -02-B11
			7ch	HKG-07 -02-D10
				HKG-05 -02-E10
FM Noise Canceller			HKN-4	
			HMPX-008	
FM Noise Canceller & FM Multi-Stereo Demodulator			HMPX-NC-03B	
ACTIVE FILTER Series			HAF series	
LADDER Resistor Networks			HRN series	
DC-DC CONVERTOR			HDC series	



## Types IHR, MHR

Type designation (example)  $\frac{\text{IHR} - 4}{\text{Type No. Number of elements}} - \frac{102}{\text{Resistance } R_1} \frac{J}{\text{Tolerance}} - \frac{681}{\text{Resistance } R_2} \frac{J}{\text{Tolerance}} \frac{E}{\text{Circuit style}}$

### Type IHR — Dimensions



Type	IHR
a	2.5n+2.5max
b	8.0 max
c	3.0 max
d	0.5 TYP
e	4.0±1.0
f	0.3 TYP
g	2.54(n-1)±0.3

Unit : mm

### — Marking —

1	Type	IHR
2	Number of resistor	(A)
3	Resistance value (3 fig.)	(B)(C)(D)
4	Tolerance	(E)
5	Circuit style	(F)
6	No. 1 terminal	• ( dot )
7	Maker's mark	HDK
8	Mfg. month code	(G)

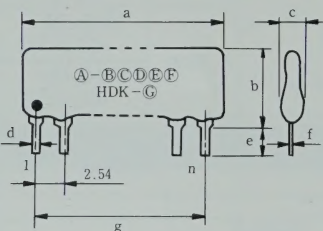
n ≥ 6

n ≤ 5

(A)-(B)(C)(D)(E)(F)  
HDK-(G)

- 1 n ≤ 13
- 2 For marking on units with two different values (R1, R2), please consult factory
- 3 Coating: black
- 4 Marking: white

### Type MHR — Dimensions



Type	MHR
a	2.54n max
b	5.08 max
c	2.54 max
d	0.5 TYP
e	4.0±1.0
f	0.3 TYP
g	2.54(n-1)±0.3

Unit : mm

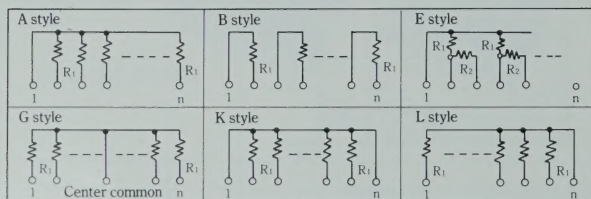
### — Marking —

1	Number of resistance	(A)
2	Resistance value (3 fig.)	(B)(C)(D)
3	Tolerance	(E)
4	Circuit style	(F)
5	No. 1 terminal	• ( dot )
6	Maker's mark	HDK
7	Mfg. month Code	(G)

n = Number of terminals

- 1 5 ≤ n ≤ 12
- 2 For marking on units with two different values (R1, R2), please consult factory.
- 3 Coating: black
- 4 Marking: white

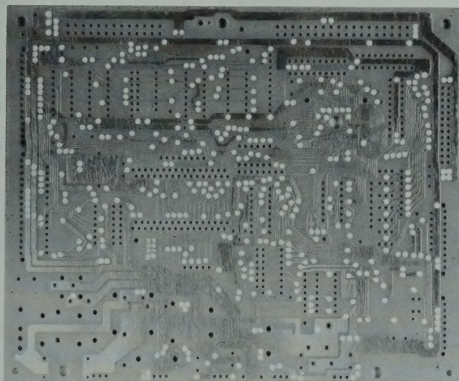
## Circuit Styles



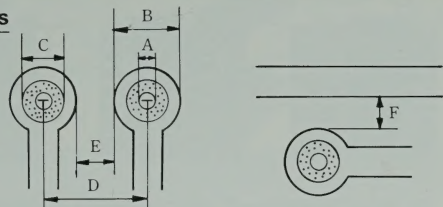
Operating temp. range	-55°C ~ +125°C
Resistance range	51Ω ~ 1 MΩ (E-24)
Tolerance	F(±1%), G(±2%), J(±5%)
Max. working voltage	150 V (100 V)
Max. overload voltage	150 V (100 V)
Special specifications on request	

Characteristics	Requirement	Test Method		Rated ambient temperature	70°C
		JIS-C-5202	MIL-R-83401		
T.C.R.	±200ppm/°C	5.2(B)	6.4.8	Rated power per element	0.125W
Short time overload	±0.5%	5.5	4.6.10	n	full rated power
Temperature cycling	±0.5%	7.4(-55°C/+125°C)	4.6.3	5 Pins	0.5 W
Load life	±2.0%	7.10(1000Hr)	4.6.18(70°C 1000Hr)	6 Pins	0.63W
Humidity load life	±2.0%	7.90(1000Hr)		7 Pins	0.75W
Humidity	±1.0%		4.6.15	8 Pins	0.85W
Exposure to high temp.	±1.0%		4.6.19	9 Pins	1.00W
Solderability	Min. 80% coverage	6.5(230°C/5S)	4.6.6	10 Pins	1.05W
Resistance to soldering heat	±0.5%	6.4(260°C/10S)	4.6.14	11 Pins	1.15W
Terminal strength (pull)	±0.5%	6.1(1) 1 kg/10S	4.6.11	12 Pins	1.25W
Terminal strength (bend)	2 ~	6.1(4)250 g	4.6.11		

## ● High Density Silver Through-hole P.C.B. (2.0mm Pitch)



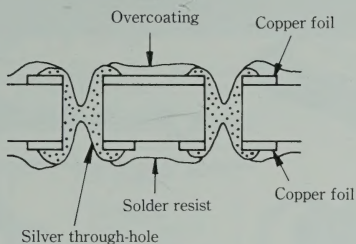
### Dimensions



unit : mm

	Description	Design Standard
A	Through-hole diameter	$0.6 \pm 0.1 \phi$
B	Copper foil land diameter	$\geq 1.5 \phi$
C	Through-hole land diameter	$\leq 1.5 \phi$
D	Pitch interval	$\geq 2.0$
E	Copper foil land distance	$\geq 0.5$
F	Distance from through-hole to the nearest copper foil	$\geq 0.5$

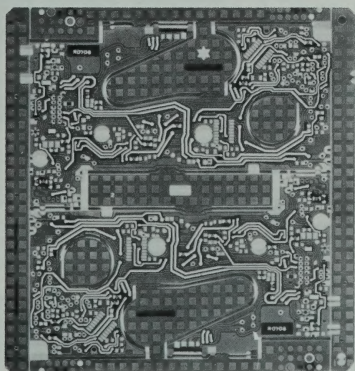
### Structure



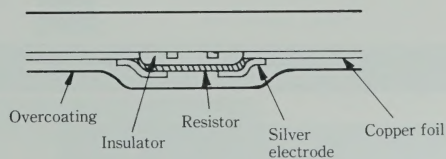
### Specifications

Item	Specification
Substrate	Material
	XPC, XXXPC, CEM-3
Through-hole Resistance	200m $\Omega$ /hole Max.
Rated Current	300mA/hole
Insulation Resistance	$10^8 \Omega$ Min.
Dielectric Strength	100V
Resistance to Soldering Heat	260°C, 5 sec, 3 times

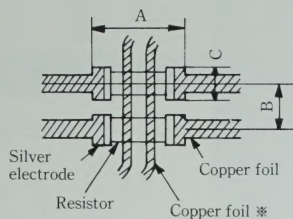
## ● Solder Dip Side Printed Resistor Circuit, Type 1608



### Structure



### Dimensions

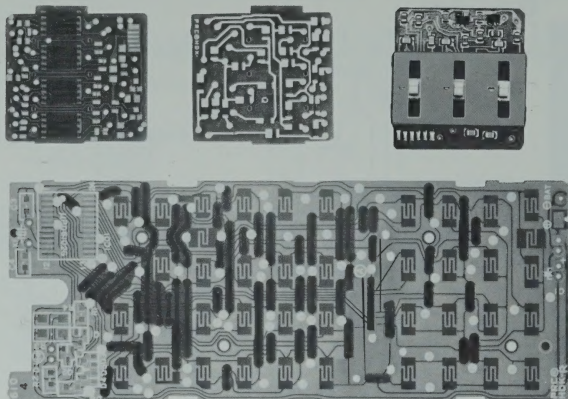


unit : mm

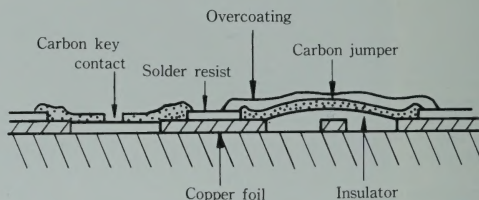
Type	A	B	C	*
3216	4.4	2.5	2.0	3pcs.
2012	3.5	2.0	1.6	2pcs.
1608	2.6	1.6	1.1	—



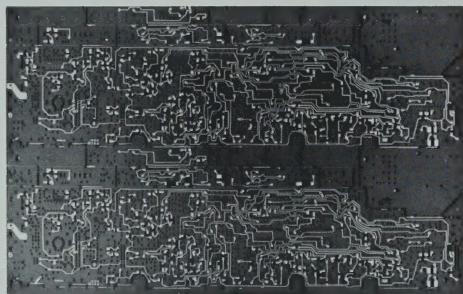
## ● Graphic Equalizer, Carbon Key Contact P.C.B.



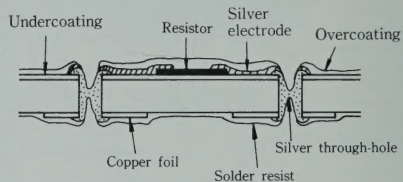
### Structure



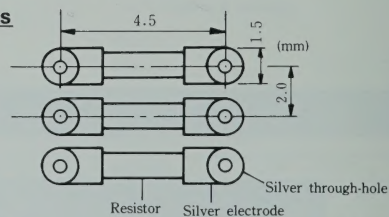
## ● High Density Printed Resistor Circuits



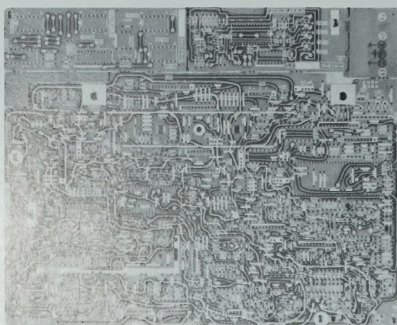
### Structure



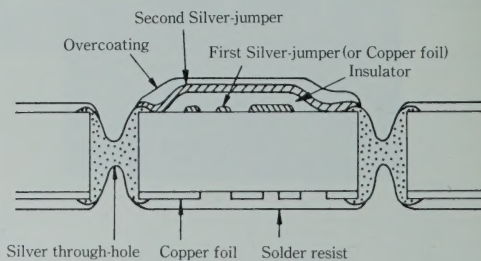
### Dimensions



## ● Cross-over Jumper-line P.C.B.



### Structure















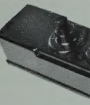





HOKURIKU

# High Voltage Functional Units

## ● F.B.T. for Color TV Sets - Unitized Focus Pack

	① HFV110 Circuit No.A Rating 8.0kvDC Zin 75~100MΩ		② HFV106 Circuit No.A Rating 9.5kvDC Zin 75~100MΩ		③ HFV105 Circuit No.A Rating 11.0kvDC Zin 75~100MΩ		④ HFV104 Circuit No.A Rating 14.0 kvDC Zin 120~160MΩ
	⑤ HFV135 Circuit No.B Rating 10kvDC Zin 75~100MΩ		⑥ HFV185 Circuit No.A Rating 9.6kvDC Zin 75~100MΩ		⑦ HFV150 Circuit No.A Rating 11.1kvDC Zin 75~100MΩ		⑧ HFV195 Circuit No.A Rating 9.6kvDC Zin 75~100MΩ

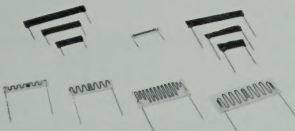
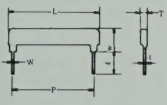
## ● F.B.T. for Color Display - Unitized Focus Pack


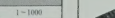
	⑨ HFV199 Circuit No.G Rating 30kvDC Zin 250~450MΩ C 1500pF ±20%		⑩ HFV112 Circuit No.A Rating 30kvDC Zin 250~450MΩ		⑪ HFV163 Circuit No.A Rating 30kvDC Zin 250~450MΩ
	⑫ HFV098 Circuit No.A Rating 30kvDC Zin 250~450MΩ		⑬ HFV187 Circuit No.H Rating 26kvDC Zin 250~450MΩ RB 250~450MΩ		⑭ HFV164 Circuit No.A Rating 26kvDC Zin 250~450MΩ


## ● For Display Units

	⑮ HFV024 Circuit No.B Rating 30kvDC Zin 250~450MΩ		⑯ HFV068 Circuit No.A Rating 30kvDC Zin 250~450MΩ		⑰ HFR094 Circuit No.D Rating 30kvDC Zin 250~1000MΩ
	⑱ HFR097 Circuit No.E Rating 30kvDC Zin 250~1000MΩ C 1500~6000pF		⑲ HFR217 Circuit No.E Rating 30kvDC Zin 250~1000MΩ C 1500~2400pF		⑳ HFR173 Circuit No.E Rating 25kvDC Zin 250~1000MΩ C 1500~9100pF
	<b>NEW</b> ㉔ HFC212 ㉕ HFC213 ㉖ HFC214 Circuit No.F Rating 30kvDC C 1500pF 3000pF 6000pF				<b>NEW</b> ㉗ HVC236 Circuit No.G Rating 30kvDC Zin 300~450MΩ C 1500pF 3000pF

## ● High Voltage Fixed Resistor (Types : HPF/HPL)

		<table><tr><th>Type</th><th>Power (W)</th><th>MAX. Volt (kV)</th><th>L (mm)</th><th>W (mm)</th><th>P (mm)</th><th>T (mm)</th><th>φ (mm)</th><th>Resistance Range (MΩ)</th></tr><tr><td>HPF-2</td><td>0.5</td><td>10K</td><td>22.5max</td><td>10max</td><td>12.5±0.5</td><td>3.0max</td><td>0.5±0.1</td><td>0.3~0.1</td></tr><tr><td>HPF-1</td><td>1</td><td>10K</td><td>32.5max</td><td>10max</td><td>27.5±0.5</td><td>3.0max</td><td>0.5±0.1</td><td>0.3~0.1</td></tr><tr><td>HPF-2</td><td>2</td><td>10K</td><td>32.5max</td><td>10max</td><td>43.0±0.5</td><td>3.0max</td><td>0.5±0.1</td><td>0.3~0.1</td></tr><tr><td>HPL-3</td><td>0.5</td><td>10K</td><td>22.5max</td><td>10max</td><td>17.5±0.5</td><td>3.0max</td><td>0.6±0.1</td><td>20 Ohms</td></tr><tr><td>HPL-1</td><td>1</td><td>10K</td><td>32.5max</td><td>10max</td><td>27.5±0.6</td><td>3.0max</td><td>0.6±0.1</td><td>20 Ohms</td></tr><tr><td>HPL-2</td><td>2</td><td>10K</td><td>32.5max</td><td>10max</td><td>43.0±1.0</td><td>3.0max</td><td>0.6±0.1</td><td>20 Ohms</td></tr><tr><td>HPF-2N</td><td>2</td><td>10K</td><td>32.5max</td><td>12max</td><td>27.5±0.5</td><td>3.0max</td><td>0.5±0.1</td><td>0.3~0.1</td></tr><tr><td>HPF-2N</td><td>2</td><td>10K</td><td>32.5max</td><td>12max</td><td>27.5±0.8</td><td>3.0max</td><td>0.6±0.1</td><td>20 Ohms</td></tr><tr><td>HPL-3N</td><td>2.5</td><td>20K</td><td>40.0max</td><td>20max</td><td>33.0±1.0</td><td>3.0max</td><td>0.6±0.1</td><td>1~2000</td></tr><tr><td>HPL-3N</td><td>3</td><td>25K</td><td>53.0max</td><td>20max</td><td>42.5±1.2</td><td>3.0max</td><td>0.6±0.1</td><td>20 Ohms</td></tr></table>	Type	Power (W)	MAX. Volt (kV)	L (mm)	W (mm)	P (mm)	T (mm)	φ (mm)	Resistance Range (MΩ)	HPF-2	0.5	10K	22.5max	10max	12.5±0.5	3.0max	0.5±0.1	0.3~0.1	HPF-1	1	10K	32.5max	10max	27.5±0.5	3.0max	0.5±0.1	0.3~0.1	HPF-2	2	10K	32.5max	10max	43.0±0.5	3.0max	0.5±0.1	0.3~0.1	HPL-3	0.5	10K	22.5max	10max	17.5±0.5	3.0max	0.6±0.1	20 Ohms	HPL-1	1	10K	32.5max	10max	27.5±0.6	3.0max	0.6±0.1	20 Ohms	HPL-2	2	10K	32.5max	10max	43.0±1.0	3.0max	0.6±0.1	20 Ohms	HPF-2N	2	10K	32.5max	12max	27.5±0.5	3.0max	0.5±0.1	0.3~0.1	HPF-2N	2	10K	32.5max	12max	27.5±0.8	3.0max	0.6±0.1	20 Ohms	HPL-3N	2.5	20K	40.0max	20max	33.0±1.0	3.0max	0.6±0.1	1~2000	HPL-3N	3	25K	53.0max	20max	42.5±1.2	3.0max	0.6±0.1	20 Ohms
Type	Power (W)	MAX. Volt (kV)	L (mm)	W (mm)	P (mm)	T (mm)	φ (mm)	Resistance Range (MΩ)																																																																																													
HPF-2	0.5	10K	22.5max	10max	12.5±0.5	3.0max	0.5±0.1	0.3~0.1																																																																																													
HPF-1	1	10K	32.5max	10max	27.5±0.5	3.0max	0.5±0.1	0.3~0.1																																																																																													
HPF-2	2	10K	32.5max	10max	43.0±0.5	3.0max	0.5±0.1	0.3~0.1																																																																																													
HPL-3	0.5	10K	22.5max	10max	17.5±0.5	3.0max	0.6±0.1	20 Ohms																																																																																													
HPL-1	1	10K	32.5max	10max	27.5±0.6	3.0max	0.6±0.1	20 Ohms																																																																																													
HPL-2	2	10K	32.5max	10max	43.0±1.0	3.0max	0.6±0.1	20 Ohms																																																																																													
HPF-2N	2	10K	32.5max	12max	27.5±0.5	3.0max	0.5±0.1	0.3~0.1																																																																																													
HPF-2N	2	10K	32.5max	12max	27.5±0.8	3.0max	0.6±0.1	20 Ohms																																																																																													
HPL-3N	2.5	20K	40.0max	20max	33.0±1.0	3.0max	0.6±0.1	1~2000																																																																																													
HPL-3N	3	25K	53.0max	20max	42.5±1.2	3.0max	0.6±0.1	20 Ohms																																																																																													



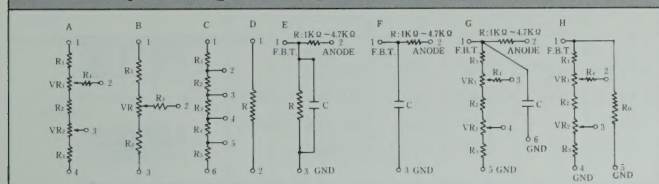
 Circuit No. C  
Rating 1.6kVDC

## Bleeder Resistor for Video Camera



㉚ Circuit No.C  
Rating 1.6kvDC

## ● Examples-High Voltage Resistor Circuits








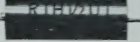




## Features

- Compact yet reliable high voltage components
- Suitable for focus incorporated type fly-back transformers in color TV sets and displays.
- Custom design available upon request.

## ◆ List of Fixed Resistors & Standard Specifications

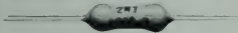

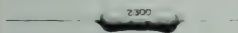
• For details, please refer to the general and individual catalogs. UNIT : mm

### ● Metal Film Resistors


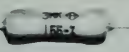
Type No.	Dimensions (mm)				Rated wattage (W)	Max. working voltage (V)	Tolerance (%)	Resistance range (Ω)	T.C.R. ppm/°C	Taping		
	L	D	ℓ	d						Universal 52mm W.	Panasert 26mm	Radial tapping
RNL(standard metal film) 	3.6±0.4 6.4±0.8 9.5±1.1	1.7±0.3 2.3±0.4 3.5±0.6	30±3 38±3 38±3	0.5±0.1 0.6±0.1 0.8±0.1	0.125 0.25 0.5	200 250 350	±1 ±2 ±5	10~510K 10~1M 10~1M	±50 ±100 ±200	○ ○ ○	○ ○ ○	○ ○ ○
RNM(miniaturized, metal film) 	3.4max 6.4±0.8	1.7±0.3 2.3±0.4	30±3 38±3	0.5±0.1 0.6±0.1	0.25 0.5	250 350	±1 ±2 ±5	10~1M 10~1M	±50 ±100	○ ○	○ ○	○ ○
RMF(flame-proof metal film) 	6.4±0.8 9.5±1.1	2.3±0.4 3.5±0.6	38±3 38±3	0.6±0.1 0.8±0.1	0.25 0.5	250 350	±1 ±2	10~1M 10~1M	±50 ±100 ±200	○ ○	○	
RNF(radial type) 	5.0max 7.5max 10.0max	2.5max 2.54max 4.0max	6.0±1.0 3.5±0.5 3.5±0.5	—	0.125 0.25 0.5	200 250 350	±1 ±2	10~200KΩ 10~1M 10~1M	±50 ±100 ±200			○ ○ ○
RTL(precision metal film) 	6.4±0.8 9.5±1.1 14.2±0.8 17.5±1.1	2.3±0.4 3.5±0.6 4.8±0.4 8.0±0.5	38±3 38±3 38±3 38±3	0.6±0.1 0.8±0.1 1.0±0.1 1.2±0.1	0.25 0.5 1.0 2.0	250 350 500 500	±0.5 ±1.0 ±2.0	10~400K 10~1M 10~2.5M 10~3M	±50 ±100 ±200	○ ○	○	○
RTH(ultra-precision metal film) 	6.8 <sup>+0.3</sup> <sub>-1.0</sub> 9.5 <sup>+1.0</sup> <sub>-0</sub> 14.5 <sup>+0.6</sup> <sub>-0.5</sub> 19.1 <sup>+2.4</sup> <sub>-0.6</sub> 27.0 <sup>+1.5</sup> <sub>-0.1</sub>	3.0 <sup>+0.5</sup> <sub>-1.0</sub> 3.2 <sup>+1.0</sup> <sub>-0</sub> 4.8 <sup>+1.5</sup> <sub>-0.7</sub> 6.4 <sup>+0.7</sup> <sub>-0.2</sub> 9.5 <sup>+1.5</sup> <sub>-0.5</sub>	38±3 38±3 38±3 38±3 38±3	0.6±0.05 0.6±0.05 0.6±0.05 0.8±0.05 0.8±0.05	0.10 0.125 0.25 0.5 1.0	200 250 300 350 500	±0.05 ±0.1 ±0.25 ±0.5 ±1.0	10~400K 10~600K 10~2M 10~3M 10~5M	±25 ±50 ±100			
RNC(established reliability molded type) 	6.8 <sup>+0.3</sup> <sub>-1.0</sub> 10.2±0.7 15.9±0.7 19.5±1.0	2.4±0.2 3.5±0.3 5.0±0.3 6.5±0.5	38±3 38±3 38±3 38±3	0.6±0.05 0.6±0.05 0.6±0.05 0.8±0.05	0.10 0.125 0.25 0.5	200 250 300 350	±0.1 ±0.5 ±1.0	20~1M 40.2~2M 49.9~4.02M 100~100K	±25 ±50 ±100			
RLR(established reliability coated type) 	3.8±0.5 6.4 <sup>+0.8</sup> <sub>-1.2</sub> 9.5±1.0 14.3 <sup>+0.8</sup> <sub>-1.0</sub> 17.5±1.0	1.7±0.2 2.3±0.2 3.5±0.6 4.8±0.4 8.1±0.4	38±3 38±3 38±3 38±3 38±3	0.4±0.05 0.6±0.05 0.8±0.05 1.0±0.05 1.1±0.05	0.125 0.25 0.5 1.0 2.0	200 250 350 500 500	±1.0 ±2.0 ±5.0	10~301K 10~1M 10~1M 10~2.7M 10~2.7M	±100			
PTR(temp. sensing resistance) 	3.6±0.4 6.4±0.8	1.7±0.3 2.3±0.4	30±3 38±3	0.5±0.1 0.6±0.1	0.125 0.25	200 250	±5 ±10	— —	— —	○ ○	○ ○	○ ○
HMGL(Cermet high resistance) 	6.4±0.8 9.5±1.0 14.2±1.5 17.5±1.5	2.3±0.5 3.5±1.0 4.8±1.0 8.0±1.0	38±3 38±3 38±3 38±3	0.6±0.1 0.8±0.1 1.0±0.1 1.2±0.1	0.25 0.5 1.0 2.0	250 500 750 1000	±0.5 ±1 ±2 ±5	1M~50M 1M~100M 1M~500M 1M~1000M	±100 ±250	○ ○	○	



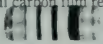
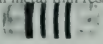
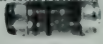
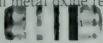

## ● Metal Oxide Film Resistors

Type No.	Dimensions (mm)				Rated wattage (W)	Max. working voltage (V)	Tolerance (%)	Resistance range (Ω)	T.C.R. ppm/℃	Taping		
	L	D	ℓ	d						Universal 52mm W	Panasert 26mm	Radial taping
MOS (miniaturized metal oxide film)	6.5±1.0	2.2±0.5	30±3	0.6±0.1	0.5	250	±2	0.2~10K	±300	○		
	9.5±1.0	3.5±1.0	30±3	0.8±0.1	1.0	350	±5	0.2~68K		○		
	12.0±1.5	4.5±1.0	38±3	0.8±0.1	2.0	350	±10	0.2~68K		○		
	16.0±1.5	6.0±1.0	38±3	0.8±0.1	3.0	350	( $<1\Omega$ )	0.2~100K		○		
	½W and 1W are color coded.											
MOF (standard metal oxide film)	9±1.0	3.5±1	30±3	0.6±0.1	0.5	250		10~50K	±350	○		
	12±1.5	4.5±1	38±3	0.8±0.1	1.0	350		10~70K		○		
	16±1.5	6.0±1	38±3	0.8±0.1	2.0	350	±2	10~100K		○		
	25±1.5	8.5±1	38±3	0.8±0.1	3.0	500	±5	10~300K				
	34±1.5	8.5±1	38±3	0.8±0.1	4.0	500	±10	10~350K				
	42±1.5	8.5±1	38±3	0.8±0.1	5.0	750		10~400K				
	54±1.5	8.5±1	38±3	0.8±0.1	7.0	750		10~500K				
	½W is color coded.											
FMR (fusing resistor)	6.5±1.0	2.0±0.5	30±3	0.5±0.1	0.25	200		1~10K	±350	○		
	9.5±1.0	3.0±1.0	30±3	0.6±0.1	0.5	250	±5	1~10K		○		
	13±1.5	4.5±1.0	38±3	0.8±0.1	1.0	300	±10	1~10K				
	17±1.5	6.0±1.0	38±3	0.8±0.1	2.0	300		1~5K				
	26±1.5	8.5±1.0	38±3	0.8±0.1	3.0	350		1~4K				
	¼W, ½W are color coded.											

## ● Carbon Composition Film Resistors

<b>HVN</b> (high voltage, high resistance) 	9±1.0	2.5±1.0	30±3	0.6±0.1	0.125	250	±5	100K~100M	—			
	13.5±1.5	3.0±1.0	38±3	0.6±0.1	0.25	500		100K~500M				
	15±1.5	3.0±1.0	38±3	0.8±0.1	0.5	1000	±5	100K~500M				
	31±2.0	8.0±1.0	41±3	0.8±0.1	0.75	5000	±10	100K~1000M				
	40±2.0	8.0±1.0	41±3	1.0±0.1	1.0	8000	±20	100K~1000M				
	52±2.0	8.0±1.0	41±3	1.0±0.1	2.0	10000		15K~1000M				
	66±2.0	9.0±1.0	41±3	1.0±0.1	3.0	15000		200~1000M				
<b>HVF</b> (high voltage, fusing) 	15±1.5	5.5±1.0	38±3	0.8±0.1	0.5	1000	±10	1M~100M	—			
	25±1.5	8.0±1.0	38±3	0.8±0.1	1.0	2000	±20	1M~100M				

## ● Leadless Type Fixed Resistors

<b>MRD</b> (cylindrical carbon film resistance) 	3.5±0.2	1.4±0.1	—	—	0.125	200	±5	2.2~1M	—			
	5.9±0.2	2.2±0.1	—	—	0.25	250		2.2~1M				
<b>MRN</b> (cylindrical metal film resistance) 	3.5±0.2	1.4±0.1	—	—	0.125	200	±1	10~510K	±50			
	5.9±0.2	2.2±0.1	—	—	0.25	250		10~1M				
<b>MPT</b> (cylindrical temp. sensing resistance) 	3.5±0.2	1.4±0.1	—	—	0.125	200	±5	10~47M	—			
	5.9±0.2	2.2±0.1	—	—	0.25	250						
<b>MMS</b> (cylindrical metal oxide resistance) 	5.9±0.2	2.2±0.1	—	—	0.5	250	±5	0.3~10K	±350			
							±10					
<b>Conductor</b> 	3.5±0.2	1.4±0.1	—	—	—	2A	—	10mΩ max	—			
	5.9±0.2	2.2±0.1	—	—	—	5A						

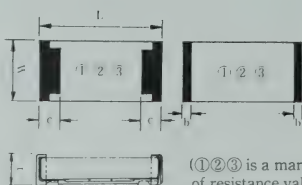
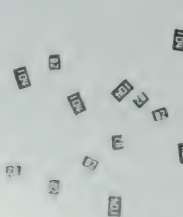
## ● Carbon Film Resistors

Type No.	Dimensions (mm)				Rated wattage (w)	Max. working voltage (V)	Tolerance (%)	Resistance range ( $\Omega$ )	T.C.R. ppm/ $^{\circ}\text{C}$	Taping		
	L	D	$\ell$	d						Universal 52mm W.	Panasert 26mm	Radial taping
NAF (flame-proof, carbon film)	6.3 $\pm$ 0.5 8.5 $\pm$ 1.0	2.54 $\pm$ <sub>-0.5</sub> <sup>0</sup> 3.9 $\pm$ <sub>-0.5</sub> <sup>0</sup>	30 $\pm$ 3 30 $\pm$ 3	0.6 $\pm$ 0.05 0.7 $\pm$ 0.05	0.25 0.5	250 300	$\pm$ 5	1.0~1M 1.0~1.5M	—	○ ○		
NAS (standard carbon film)	3.4max 6.0 $\pm$ 1.0 8.5 $\pm$ 1.5	1.8 $\pm$ 0.1 2.3 $\pm$ 0.2 3.5 $\pm$ 0.2	30 $\pm$ 3 30 $\pm$ 3 30 $\pm$ 3	0.45 $\pm$ 0.05 0.6 $\pm$ 0.1 0.7 $\pm$ 0.1	0.167 0.25 0.5	250 250 350	$\pm$ 2 $\pm$ 5	2.2~1M 1.0~1M 1.0~2.2M	—	○ ○ ○	○ ○	○ ○
NAT (miniaturized carbon film)	3.4max	1.8 $\pm$ 0.1	30 $\pm$ 3	0.45 $\pm$ 0.05	0.25	250	$\pm$ 2 $\pm$ 5	2.2~1M	—	○	○	○
NAM (miniaturized, flame-proof carbon film)	6.3 $\pm$ 0.5 8.5 $\pm$ 1.0	2.54 $\pm$ <sub>-0.5</sub> <sup>0</sup> 3.9 $\pm$ <sub>-0.5</sub> <sup>0</sup>	30 $\pm$ 3 30 $\pm$ 3	0.6 $\pm$ 0.1 0.7 $\pm$ 0.1	0.5 1.0	300 350	$\pm$ 5	10~1M 10~1M	—	○ ○	○	
RD (non-insulated carbon film)	9 $\pm$ 1.5 13 $\pm$ 1.5 15 $\pm$ 1.5 24 $\pm$ 1.5 52 $\pm$ 1.5	2.5 $\pm$ 1 2.5 $\pm$ 1 4.5 $\pm$ 1 7.5 $\pm$ 1 7.5 $\pm$ 1	38 $\pm$ 3 38 $\pm$ 3 38 $\pm$ 3 38 $\pm$ 3 38 $\pm$ 3	0.6 $\pm$ 0.1 0.6 $\pm$ 0.1 0.8 $\pm$ 0.1 0.9 $\pm$ 0.1 0.9 $\pm$ 0.1	0.125 0.25 0.5 1.0 2.0	250 300 350 500 750	$\pm$ 1 $\pm$ 2 $\pm$ 5	5.1~1M 5.1~1M 5.1~2.2M 5.1~5.1M 10~5.1M	—			
HES (highly reliable mold type)	6.8 $\pm$ 0.5 9.5 $\pm$ 1.0 9.5 $\pm$ 1.0 14.3 $\pm$ 1.0 17.5 $\pm$ 1.0	2.3 $\pm$ 0.3 2.4 $\pm$ 0.4 3.5 $\pm$ 0.4 5.7 $\pm$ 0.4 8.1 $\pm$ 0.4	30 $\pm$ 3 38 $\pm$ 3 38 $\pm$ 3 38 $\pm$ 3 38 $\pm$ 3	0.5 $\pm$ 0.1 0.7 $\pm$ 0.1 0.8 $\pm$ 0.1 1.0 $\pm$ 0.1 1.2 $\pm$ 0.1	0.125 0.25 0.5 1.0 2.0	150 250 350 500 500	$\pm$ 1 $\pm$ 2 $\pm$ 5	10~200K 10~1M 10~1M 10~3M 10~5M	—	○		

## ● Flat Chip Resistors

Appearance

Size



(①②③ is a marking of resistance value)

unit : mm

	L	W	t	c	b
0.05	0.8 $\pm$ <sub>-0.1</sub> <sup>+0.2</sup>	0.45~0.65	0.25 $\pm$ 0.20	0.25 $\pm$ 0.20	
0.1	1.25 $\pm$ <sub>-0.1</sub> <sup>+0.2</sup>	0.45~0.65	0.40 $\pm$ 0.20	0.40 $\pm$ 0.20	
0.2	1.6 $\pm$ <sub>-0.15</sub> <sup>+0.1</sup>	0.50~0.70	0.50 $\pm$ 0.20	0.50 $\pm$ 0.20	
0.3	2.0 $\pm$ <sub>-0.15</sub> <sup>+0.1</sup>	0.5~0.65	0.50 $\pm$ 0.20	0.50 $\pm$ 0.20	

Type	Rated wattage (W)	Max. working voltage (V)	Max. overload voltage (V)	Resistance range ( $\Omega$ )	Tolerance
CR 1/16	0.0625	50	100	4R7~1M $\Omega$	(F)JKM
CR 1/10	0.10	100	200	1 $\Omega$ ~20M	(F)JKM
CR 1/8	0.125	200	400	1 $\Omega$ ~20M	(F)JKM
CR 1/4	0.25	200	400	47 $\Omega$ ~1M $\Omega$	JK

### FEATURES

- The resistance element is made of thick film material. Resistance tolerance of  $\pm 0.5\%$  is available.
- Terminations; Electrodes are printed on both the surface and bottom of the substrate, featuring good adhesion to the PCB. Show excellent effect against the warpage and twist of the board and Manhattan syndrome.
- Jumper chips are available at economical prices.

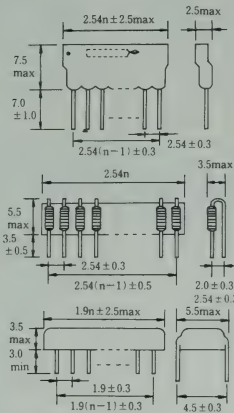


## ● Super Precision Resistance Network, SPN Series

SIP



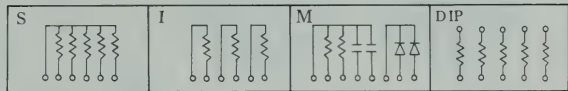
DIP (for IC burn-in)



### Features

- A precision resistance network of high quality and high reliability, utilizing the characteristics of metal film resistors.
- The accuracy of the resistance is  $\pm 0.05\%$  in absolute precision, and  $\pm 0.1\%$  in relative precision.
- The temperature characteristic is available up to  $\pm 10 \text{ ppm}/^\circ\text{C}$  in absolute precision, and  $5 \text{ ppm}/^\circ\text{C}$  in relative precision.
- The resistance value ranges from  $10 \Omega$  to  $50 \text{ M}\Omega$ .
- Applicable products include metal film resistors, carbon film resistors, metal glazed resistors, chip resistors, capacitors, diodes, etc.

### Example of circuits



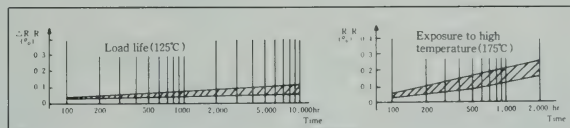
## ● Established Reliability Metal Film Resistors

### ○ RNC (Established Reliability Molded Metal Film Resistors)

Characteristics	REQUIREMENTS
Operating Temp. Range	$-65^\circ\text{C} \sim +175^\circ\text{C}$
Thermal Shock	$\pm (0.2\% + 0.01 \Omega)$
Overload	$\pm (0.2\% + 0.01 \Omega)$
Low Temp. Operation	$\pm (0.15\% + 0.01 \Omega)$
Insulation Resistance	Over $10^4 \text{ M}\Omega$
Dielectric Withstanding Voltage	$\pm (0.15\% + 0.01 \Omega)$
Moisture Resistance	$\pm (0.4\% + 0.01 \Omega)$
Load Life	$\pm (0.5 + 0.01 \Omega) / 2000 \text{ Hr}$
Extract Water Conductivity	$\pm (0.1\% + 0.01 \Omega)$
Vibration	$\pm (0.2\% + 0.01 \Omega)$
	$1.0 \times 10^{-6} \text{ V/cm}$
Resistance Range	RNC55J ( $\frac{1}{8} \text{ W}$ ) $20 \Omega \sim 1 \text{ M}\Omega$ 60J ( $\frac{1}{8} \text{ W}$ ) $40 \Omega \sim 2 \text{ M}\Omega$ 65J ( $\frac{1}{4} \text{ W}$ ) $50 \Omega \sim 4 \text{ M}\Omega$ 70J ( $\frac{1}{2} \text{ W}$ ) $100 \Omega \sim 100 \text{ K}\Omega$

- Qualified by Japanese Defense Ministry: MIL-R-55182E
- Established Reliability Resistors.
- Failure-rate level (S)  $0.001\% / 1000 \text{ Hr}$
- Approval No. M-55182-86-0358-2B
- Approval Date: Dec. 12, 1986

- Resistance temperature coefficient:  $\pm 100 \text{ ppm}/^\circ\text{C}$ ,  $\pm 50 \text{ ppm}/^\circ\text{C}$ ,  $\pm 25 \text{ ppm}/^\circ\text{C}$
- Resistance tolerance: F ( $\pm 1\%$ ), D ( $\pm 0.5\%$ ), B ( $\pm 0.1\%$ )
- Extended life: 10,000 hours,  $\pm (2\% + 0.01 \Omega)$
- Available resistance value: E-192 series

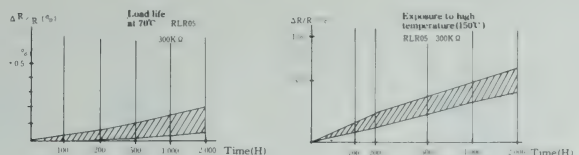


### ○ RLR (Established Reliability, Insulation Coating Metal Film Resistor)

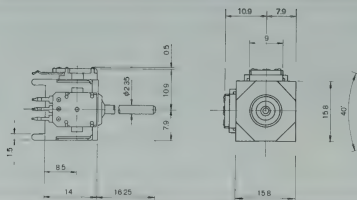
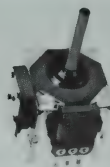
Characteristics	REQUIREMENTS
Operating Temp. Range	$-65^\circ\text{C} \sim +150^\circ\text{C}$
Thermal Shock	$\pm (0.25\% + 0.05 \Omega)$
Short Time Overload	$\pm (0.5\% + 0.05 \Omega)$
Low Temp. Operation	$\pm (0.25\% + 0.05 \Omega)$
Insulation Resistance	Over $10^4 \text{ M}\Omega$
Load Life	$\pm (2\% + 0.01 \Omega) / 2,000 \text{ Hr}$
Resistance to Soldering Heat	$\pm (0.25\% + 0.05 \Omega)$
Vibration	$\pm (0.5\% + 0.05 \Omega)$
Moisture Resistance	$\pm (1\% + 0.05 \Omega)$
Resistance Range	RLR05C ( $\frac{1}{8} \text{ W}$ ) $10 \Omega \sim 30 \text{ K}\Omega$ 07C ( $\frac{1}{4} \text{ W}$ ) $10 \Omega \sim 1 \text{ M}\Omega$ 20C ( $\frac{1}{2} \text{ W}$ ) $10 \Omega \sim 1 \text{ M}\Omega$ 32C (1 W) $10 \Omega \sim 2.7 \text{ M}\Omega$ 42C (2 W) $10 \Omega \sim 2.7 \text{ M}\Omega$

- Qualified by Japanese Defense Ministry: MIL-R-39017C
- Established Reliability Resistors.
- Failure-rate level (R)  $0.01\% / 1000 \text{ Hr}$
- Approval No. M-39017-86-0358-2C
- Approval Date: Aug. 26, 1988

- Resistance temperature coefficient:  $\pm 100 \text{ ppm}/^\circ\text{C}$
- Resistance tolerance: F ( $\pm 1\%$ ), G ( $\pm 2\%$ ), J ( $\pm 5\%$ )
- Extended life: 10,000 hours,  $\pm (4\% + 0.05 \Omega)$
- Available power rating:  $\frac{1}{8} \text{ W}$ ,  $\frac{1}{4} \text{ W}$ ,  $\frac{1}{2} \text{ W}$ , 1 W, 2 W
- Available resistance value: E-96 series

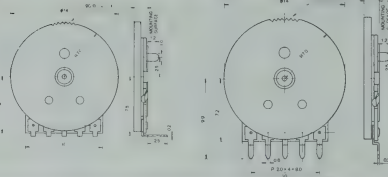


## JOY STICK POTENTIOMETER

**VA09J2**


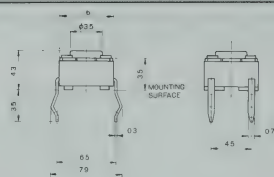
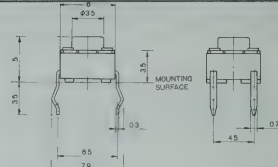
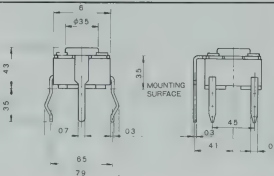
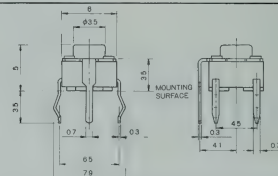
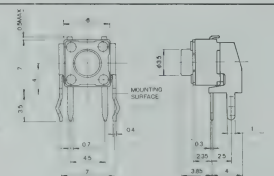
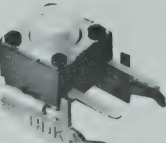
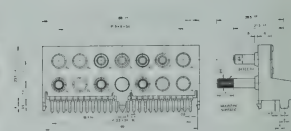
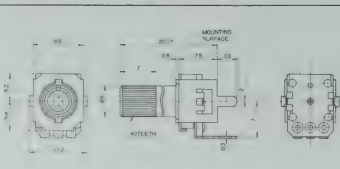
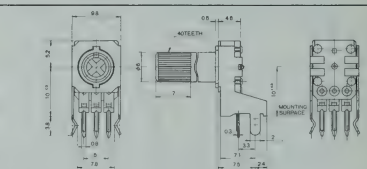
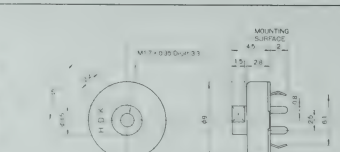
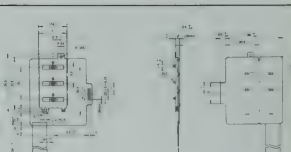
- RATING : 0.02W
- WORKING VOLTAGE :  
50VAC OR 10VDC MAX.
- RESISTANCE VALUE :  
100K  $\Omega$   $\pm$  20%
- TRAVELING ANGLE : 40°
- OPERATING TORQUE :  
100 ~ 700gf·cm

## ULTRA-LOW PROFILE ROTARY POTENTIOMETERS

**VT09CH1, VT09CH2**


- RATING : 0.03W
- WORKING VOLTAGE :  
50VAC MAX.
- RESISTANCE RANGE  
10K  $\Omega$  ~ 500K  $\Omega$
- ROTATION ANGLE : 200°
- OPERATING TORQUE :  
5 ~ 100gf·cm

## POTENTIOMETERS & TACTILE SWITCHES

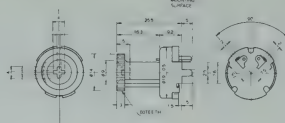
**KSM0611**

**KSM0612**

**KSM0621**

**KSM0622**

**KSM0632**

**VRS3004**

**VA09CH1**

**VA09CV1**

**VA09CH**

**VSG210**




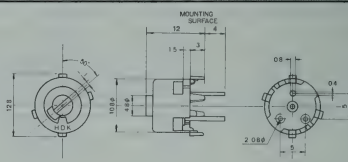


## TRIMMER POTENTIOMETERS

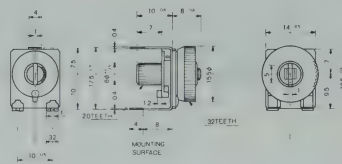
■ VG191S



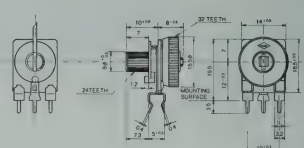
■ VG101



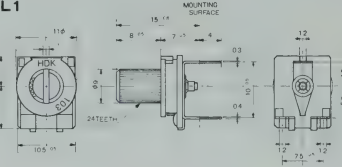
■ VZ152L, VG152L



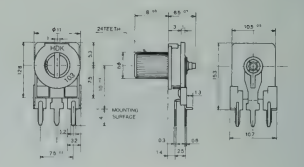
■ VZ152H, VG152H



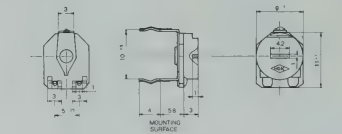
■ VZ103SL1, VG103SL1



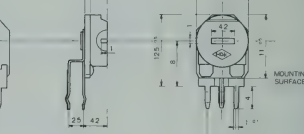
■ VZ103SH1, VG103SH1



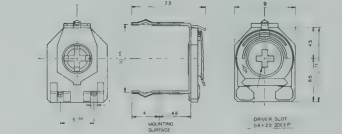
■ VZ084TL1, VG084TL1



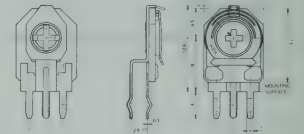
■ VZ084TH1, VG084TH1



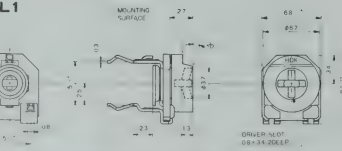
■ VZ087L1, VG087L1



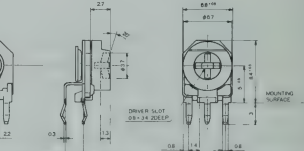
■ VZ087H1, VG087H1



■ VZ068TL1, VG068TL1



■ VZ068TH1, VG068TH1



## FOR AUTOMATIC INSERTION & BLOCK TYPE

HOKURIKU

■ VZ067TH1C

■ KSR806V2

■ VE12CV1B4

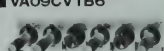
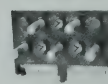
■ VZ067TL1C



■ VRC708V

■ VA09CV1B6

■ VZ067TLT

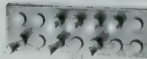


■ VRS3004V

■ VA09CV1B9

■ VA09CH1B2

■ RG06AHT

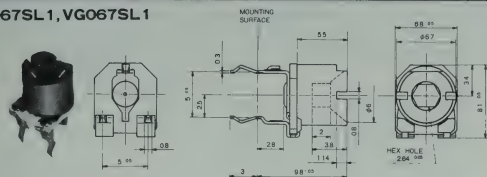


■ VG042CT

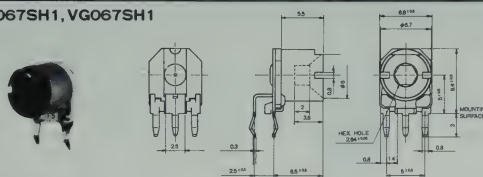


## TRIMMER POTENTIOMETERS

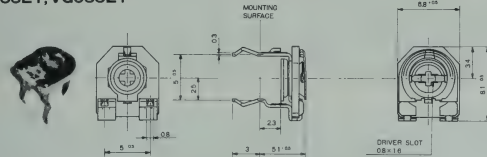
■ VZ067SL1, VG067SL1



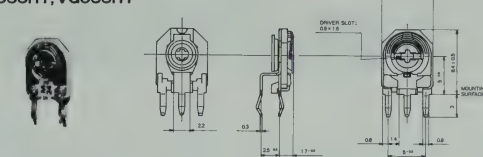
■ VZ067SH1, VG067SH1



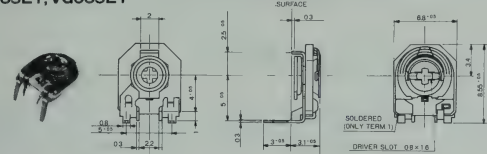
■ VZ066L1, VG066L1



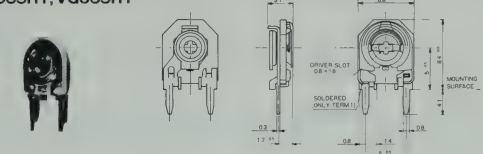
■ VZ066H1, VG066H1



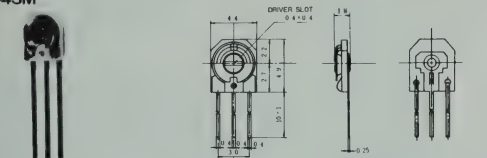
■ VZ065L1, VG065L1



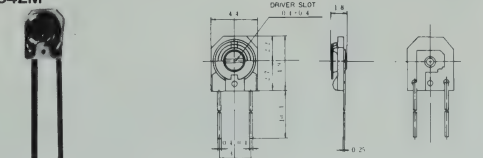
■ VZ065H1, VG065H1



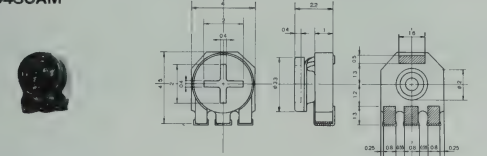
■ VG043M



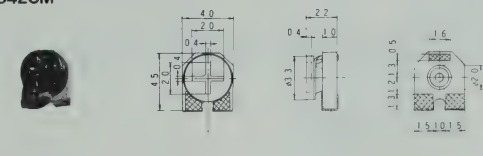
■ VG042M



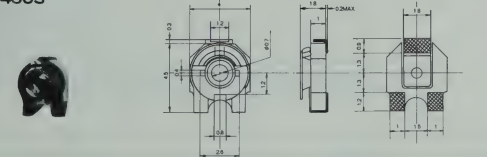
■ VG043CAM



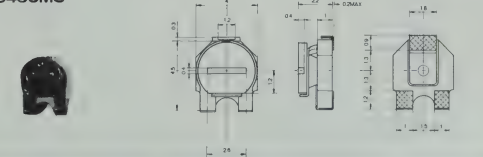
■ VG042CM



■ VG043CS



■ VG043CMS

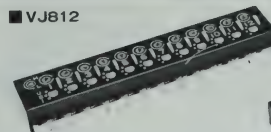


## ● ELECTRONIC AUTO PRODUCTS, ELECTRONIC TUNING POTENTIOMETERS

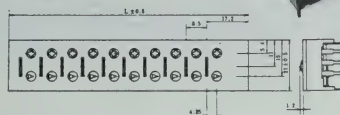
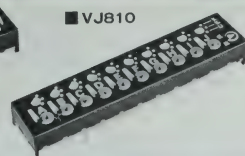


- FUEL SENSOR UNIT  
(MATERIAL)  
ALUMINA CERAMIC  
METAL GLAZE
- AIR CONDITIONING  
ACTUATOR SENSOR  
(MATERIAL)  
PHENOL or EPOXY  
CARBON COMPOSITION

■ VJ812



■ VJ810



Type	No. of keys	L. Length
VJ808	8Key	81.5mm
VJ810	10Key	98.5mm
VJ812	12Key	115.5mm

## Thin Film Hybrid Integrated Circuits



Part Name	Application	Components	Features
Thin Film Hybrid IC Substrate	Thin Film IC	Substrate: Highly pure alumina :titanic barium	Precise and sophisticated pattern.
	Micro wave IC	Electrode: NiCr-Au evaporated film :Au plated film 5μm MAX Resistance: Ta2N film	Suitable for high frequency HIC.

Custom-made pattern is available upon request.

## Tantalum Thin Film Micro Chip Resistors

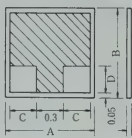

&lt;New Product&gt;

These types are micro chip resistors for gold bonding.

MCHR-2



MCHR-3


Resistance  Electrode 

Type No.	Dimensions				Resistance Range (Ω)	Rated Power (mw)
	A	B	C	D		
MCHR-2	0.75±0.05	0.75±0.05	0.175±0.02	0.35±0.02	10K ~ 1.8K	20
MCHR-3	0.75±0.05	1.20±0.05	0.175±0.02	0.30±0.02	1.8K ~ 4.0K	20

Resistance values:E-12 series is recommended.

## Ultra High Frequency Device

## ① Attenuator Chips



CAT



CATL



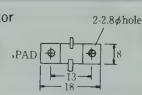
CATC

Type No.	Attenuation (dB)	Impedance (Ω)	Frequency Range (GHz)	Outside Dimensions (L×W mm)	Remarks
CAT	0 ~ 40	50	DC~10GHz	8×6	coaxial type
CATL	1 ~ 32	50	DC ~ 5GHz	8×6	strip line type
CATC	1 ~ 32	50	DC ~ 2GHz	8×5.25	

## ② Power Attenuator



PAD



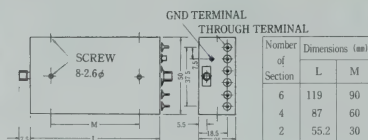
PADU

Type No.	Attenuation (dB)	Impedance (Ω)	Frequency Range (GHz)	Max. Power (W)
PAD	1 ~ 32	50	DC ~ 5	2
PADU	3, 6, 10, 20	50	DC ~ 4	100

## ③ Programmable Attenuator (New Product)



PGAT

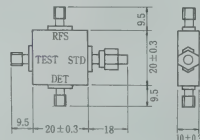


Item	Specification
Frequency	DC ~ 1,300 MHz
Impedance	50 Ω
Max. Input Power	20 dBm
Unmatching Attenuation	20 dB
Coupling plug	SMA type
Relay Control	DC12V 30mA (1 section)

## ④ High Frequency Bridge (New Product)



HFB



Item	Specification
Frequency	10 ~ 2,000 MHz
Impedance	50 Ω
VSWR Range	1.05 ~
Max. Input Power	20 dBm
Coupling plug	SMA type

## ⑤ High Power Resistors (Dummy Load)



DL



H



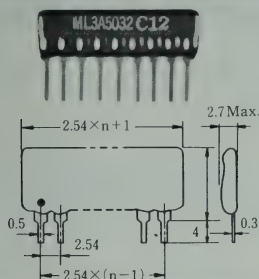
Dimensions (mm)	Impedance (Ω)		Rated Power (W)	Thermo-resistance (°C/W)	Frequency Range (GHz)
	B	C			
0.5	8±0.3	15±0.3	10	4.5	DC ~ 1.5
1.0	8±0.3	15±0.3	30	3.3	DC ~ 1.5
1.5	11±0.3	18±0.3	50	2.0	DC ~ 1.0
2.0	32±0.3	34±0.3	100	1.0	DC ~ 0.2

For details, please ask for individual catalogs.

Various custom-made types are available upon request.

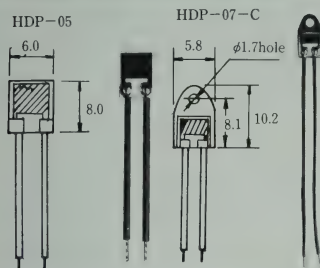


## High Precision Tantalum Thin Film Network



Type	Specifications
H A R	Resistance range: 10 $\Omega$ - 330K $\Omega$ Absolute tolerance: C ( $\pm 0.25\%$ ), B ( $\pm 0.1\%$ ), A ( $\pm 0.05\%$ ) Relative tolerance: $\pm 0.2\%$ , $\pm 0.1\%$ , $\pm 0.05\%$ Absolute temperature coefficient: $(-100 \pm 30 \text{ ppm}/^\circ\text{C})$ Relative temperature coefficient: $\pm 20 \text{ ppm}/^\circ\text{C}$ , $\pm 10 \text{ ppm}/^\circ\text{C}$ , $\pm 5 \text{ ppm}/^\circ\text{C}$ Working temperature range: $-40^\circ\text{C}$ to $125^\circ\text{C}$ Maximum applicable voltage: 150V

## Dew Sensors



Type	Application	Specifications
HDP-05	Dew point detection for VTR, camera, duplicator, etc.	Working voltage: below AC, DC0.8V Working temperature range: $-10 \sim 60^\circ\text{C}$ Working humidity range: 0 - 100%RH
HDP-07		Resistance value: 75% 93% 100% HDP-05 < 10K $\Omega$ < 80K $\Omega$ > 100K $\Omega$ HDP-07 < 20K $\Omega$ < 100K $\Omega$ > 200K $\Omega$ Response: < 10 sec. (over 100K $\Omega$ , over 200K $\Omega$ )

Lead wires, brackets and connectors are supplied when required.

## Humidity Sensors

Type	Application	Specifications			
			HIS-02 (-A)	HSU-01	HSU-03
HIS (Sensor element)	Air conditioner humidifier	Working temperature range:	0 ~ 50 $^\circ\text{C}$	(temp. compensation range)	15 ~ 35 $^\circ\text{C}$
HSU (with temperature compensation circuit)	medical equipment	Working humidity range:	20 ~ 90%RH	(humidity compensation range)	40 ~ 80%RH (at 25 $^\circ\text{C}$ )
	environment control	Impedance:	55K $\Omega$ (50 $\pm$ 5%RH)	0.6 (60 $\pm$ 2.5%RH)	
	warehouse, green house	Input/output voltage ratio:			
	agricultural use	Voltage for output detection	AC1V sine wave or rectangular wave (Duty 1:1)		3V (60 $\pm$ 5%RH)
		Rated voltage			DC 5V
		Frequency	(recommendation) 1KHz		

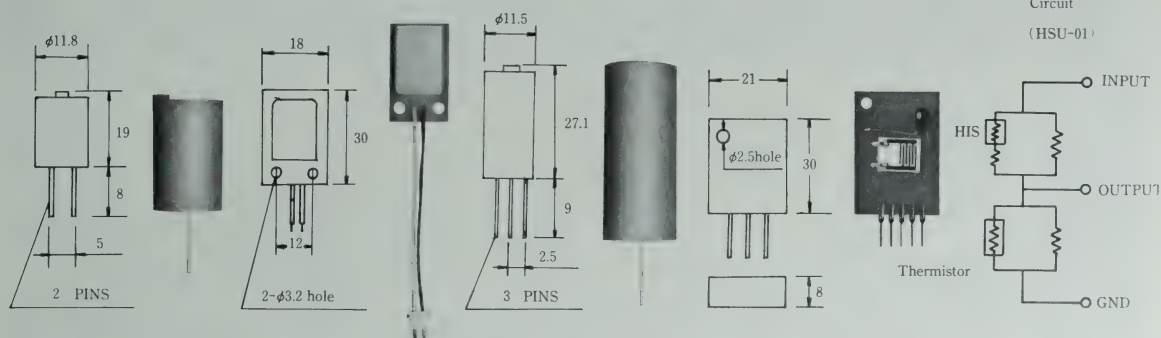
HIS-02

HIS-02-A

HSU-01

HSU-03

Temperature Compensation Circuit (HSU-01)





UNIT : mm

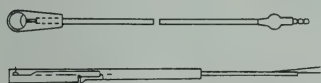


## PART NUMBER CODE—NTC THERMISTOR

1								CHECK CODE
TYPE	DIMEN- SIONS	1st Figure	2nd Figure	Multiplier	PIN STYLE	Tolerance	Application Coating, Marking	Serial No. 0~9
RESISTANCE VALUE								

## ● NTC THERMISTOR SENSORS

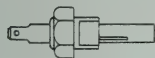
■ Thermo sensor for air conditioner



■ Indication of fuel oil level for automobiles



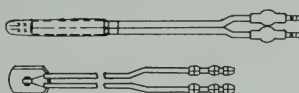
■ Thermo sensor for automobile radiator



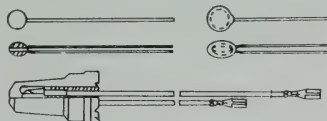
■ For thermal head of printer



■ Thermo or defroster sensor for refrigerators



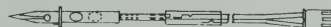
■ Thermo sensor for electronic fuel injection devices for automobiles



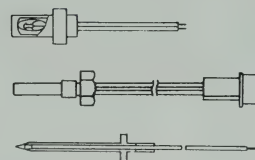
■ Thermo sensor for clinical thermometer



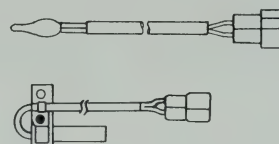
■ For oil fan heater



■ Sensor for hot water boiler



■ For automobile air conditioner



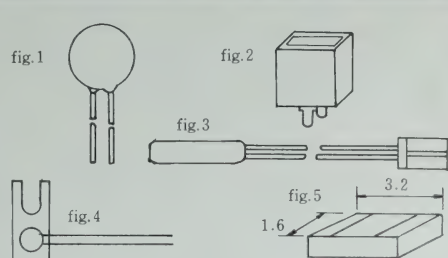
■ For other applications

Thermistor bolometers

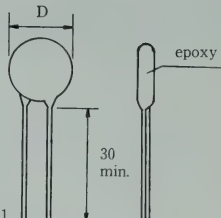
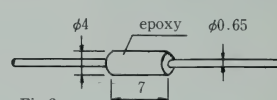
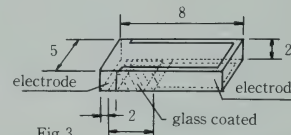
Absolute humidity sensors

Thermal sensor for PPC.

## ● PTC THERMISTORS

Part No.	Resistance (Ω)	Curie point (°C)	Rating voltage (V rms)	fig.	Outline
◆ Degaussing circuit of TV					
PA1D×××××	at 25°C	5~36	100	1	
PA5D×××××			120	2	
PA6D×××××			200	2	
◆ Dew prevention heater					
PF2R×××××	at 20°C	20~60	50, 60	4	
PF4R×××××			16~30 (V)	3	
◆ Temperature compensation & detector					
PE1D×××××	at 25°C	1,000~10,000	Resis. temp. coef. (type.)		
PE0S×××××			3.5~4.5 (%/°C)		

## ● MNR VARISTORS

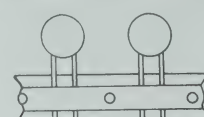
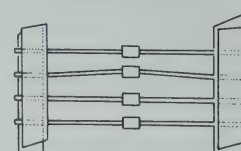

Part No.	Varistor voltage DC(V)	Max. applied circuit voltage		Surge current (A) (8×20μs)					Outline
		AC(Vrms)	DC(V)	D					
◆ ZR Series (Radial type)				20	14	10	7	5	
18ZR	18±20%	10	13		500	250	125	50	
33ZR	33±10	20	26		"	"	"	"	
47ZR	47 "	30	38		"	"	"	"	
68ZR	68 "	40	56		"	"	"	"	
82ZR	82 "	50	65		2,500	1,250	600	200	
100ZR	100 "	60	85		"	"	"	"	
◆ NR Series (Radial type)									
150NR	150±10%	95	120	4,000	2,500	1,250	600	200	
250NR	250 "	160	205	"	"	"	"	"	
350NR	350 "	220	285	"	"	"	"	"	
450NR	450 "	280	370	"	"	"	"	"	
500NR	500 "	315	410	"	"	"	"	"	
700NR	700 "	440	565	"	"	"	"	"	
1,000NR	1,000 "	630	810	"	"	"	"	"	
1,400NR	1,400 "	890	1,130	"	"	"	"	"	
◆ NA Series (Axial type)									
100NA	100±10%	60	80			20			
150NA	150 "	90	120			"			
180NA	180 "	109	145			"			
220NA	220 "	130	175			"			
330NA	330 "	200	265			"			
430NA	430 "	260	350			"			
◆ NH Series (Chip type)									
39NH	39±10%	25	31			250			
68NH	68 "	40	56			"			
100NH	100 "	60	81			"			
150NH	150 "	95	127			"			
200NH	200 "	130	175			"			
240NH	240 "	150	200			"			
390NH	390 "	250	330			"			

## ● SILICON CARBIDE VARISTOR for telephone sets

Part No.	current (mA)	voltage (V)	Max. permissible power (W)	Non-linear characteristics		Outline
				n	V 1mA	
108D20(C)*	100	8±10%	1.0	3.0	2.2	Outline as per Fig.1 * : C shall be omitted for uncoated parts.
211D20(C)*	10	10 "	"	"	2.1	

### ★ Taping specification

Packing in taping is based upon the specifications EIAJ-RC and RC-1009A.

	Radial Taping	Axial Taping	Taping for Chips
m	Thermistor : 112, 115 series Varistor : ZR, NR series	Varistor : NA series	Thermistor : 157 series
Outline			



U l t r a   H i g h   F r e q -  
u e n c y   A t t e n u a t o r

S p e c i f i c a t i o n





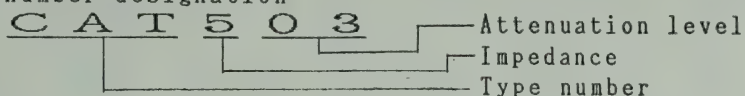
## 1. Application

This specification is applied for ultra high frequency attenuator.

## 2. Specification, Dimensions

Table-1 for its specification, Fig-1~6 for its dimensions

## 3. Type number designation

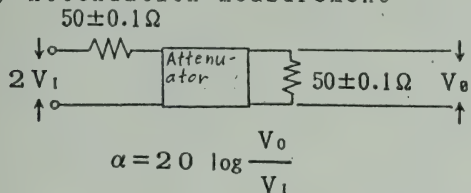


## 4. Marking

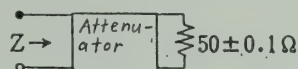
- For CAT, CATL and CATC, there are no marking. However, width of resistive film indicates its attenuation level.
- For PAD and PADA, there are marking of attenuation level and manufacturing date code on it.
- For PADQ, there are marking of attenuation level, impedance value and manufacturing date code on it.

## 5. Measuring circuit

## a) Attenuation measurement



## b) Impedance measurement



## 6. Usage and precaution

- CAT type is designed to get 50ohm of characteristic impedance with setting it in external conductor(inner diameter:4.1φ) of SMA type connector.
- For CAT and CATL type, please connect top and bottom GND electrodes together or connect them with GND electrode of reverse side, *when installment.*
- For PAD type, Please use it attaching to heat sink.
- Please keep temperature of resistive film below 125°C in use.
- Lead pin is hooked up with high temperature (309°C) solder.
- For CAT, CATL installment, please do not use milnut solder.
- Please pay attention not to apply force in the direction of peeling-off since lead pin is structurally weak at strength of that direction.



Table-1 Ultra High Frequency Attenuator, Specification

Type Number	Attenuation Range (dB)	Tolerance (dB)	Impedance ( $\Omega$ )	Max. Power (W)	Heat Resistance		Frequency Range (GHz)	Operating Temperature (°C)	Life Cycle		Dimension
					(°C/W)	(°C/W)			Storage	High Temp. Storage/Type	
CAT	0.0.1.0.2.0.4	$\pm 0.05$	$50 \pm 2$	0.2			DC~10	-55~125	INP $\pm 1\Omega$	Distributed Constant, Coaxial type	Fig-1
	0.5.0.8.1	$\pm 0.1$							ATT $\pm 0.2\text{dB}$	Chip	
	2~10.15.16.20	$\pm 0.2$									
	25.30	$\pm 0.3$									
	40	$\pm 0.05$									
CATL	1	$\pm 0.1$	$50 \pm 2$	0.2			DC~5	-55~125	INP $\pm 1\Omega$	Distributed Constant, Strip Line	Fig-2
	2~6.8.10	$\pm 0.2$							ATT $\pm 0.2\text{dB}$	Chip	
	12.15.16.18.20	$\pm 0.05$									
	24.25.30.32	$\pm 0.1$									
	1	$\pm 0.2$									
CATC	2~10.12.15.18.20	$\pm 0.05$	$50 \pm 2$	0.2			DC~2	-55~125	INP $\pm 1\Omega$	Distributed Constant	Fig-3
	12.15.16.18.20	$\pm 0.1$							ATT $\pm 0.2\text{dB}$	Chip	
	25.30.32	$\pm 0.2$									
	1	$\pm 0.05$									
	2~6.8.10	$\pm 0.1$									
PAD	12.15.16.18.20	$\pm 0.2$	$50 \pm 2$	2.0	15		DC~5	-55~125	INP $\pm 1\Omega$	Distributed Constant, Strip Line	Fig-4,5
	24.25.30.32	$\pm 0.2$							ATT $\pm 0.2\text{dB}$		
	1	$\pm 0.05$									
	2~6.8.10	$\pm 0.1$									
	12.15.16.18.20	$\pm 0.2$									
PADQ	1.2.3.4.6.8.10.20	$\pm 0.2$	$50 \pm 2$	6.0	5		DC~3	-55~125	INP $\pm 2\Omega$	Centralized Constant type	Strip Line Fig-6
		$\pm 0.2$							ATT $\pm 0.2\text{dB}$		

(DC Value)





# Ultra High Frequency Attenuator Dimensions

Unit : mm



 --- Electrode  
 --- Attenuation Resistor

Fig-1. CAT(Chip)

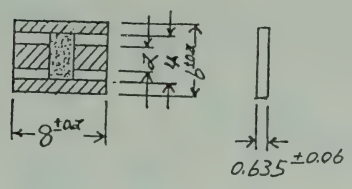


Fig-2. CATL(Chip)

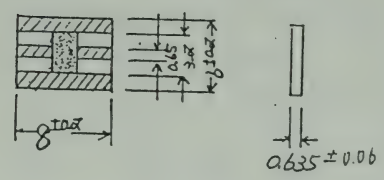


Fig-3. CATC(Chip)

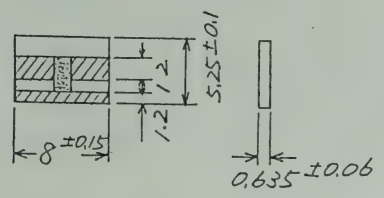


Fig-4. PAD

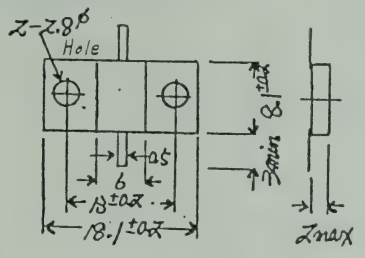


Fig-5. PADA

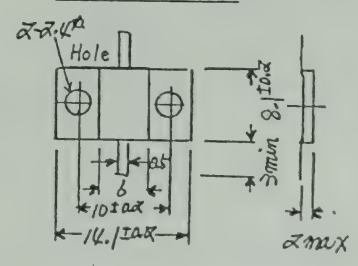
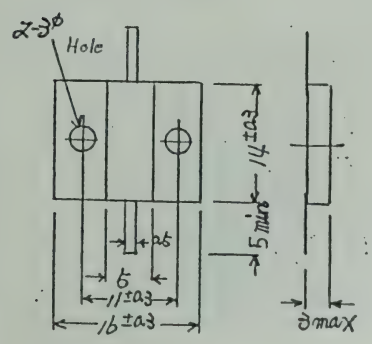


Fig-6. PADQ



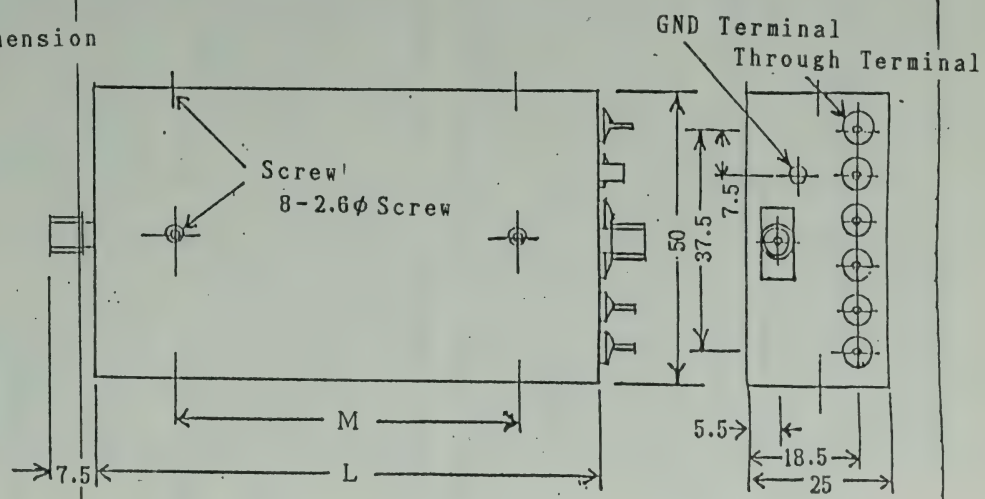




# Programmable Attenuator

## Specification

### Dimension



### Type Number Dimension

Type Number	Section Number	Dimension (mm)	
		L	M
PGAT6-○○○○○○○	6	119	90
PGAT4-○○○○○	4	87	60
PGAT2-○○	2	55.2	30

### Attenuation Value

1,2,4,8, — As the number shows

A — 16dB    B — 32dB    C — 10dB  
D — 15dB    E — 20dB    F — 25dB  
G — 30dB

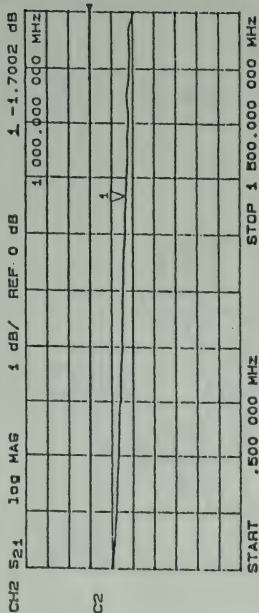
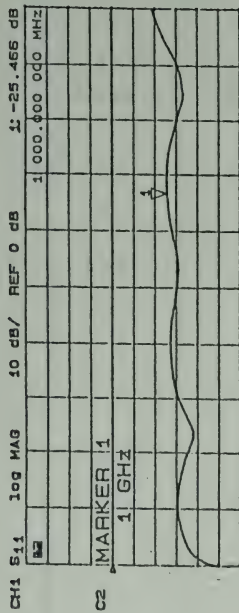
### Performance

Item	Specification
Frequency	DC~1300 MHZ
Impedance	50Ω
Max. Input Power	20dBm
Unmatch Att.	20dB
Coupling Plug	SMA Type
Relay Control	DC12V 30mA (1Section)

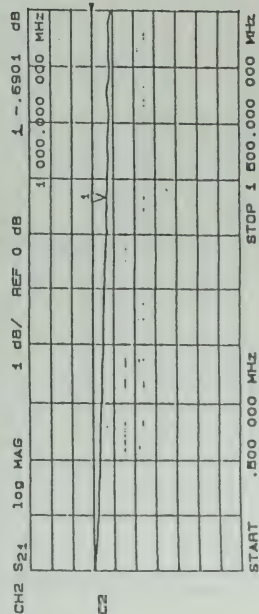
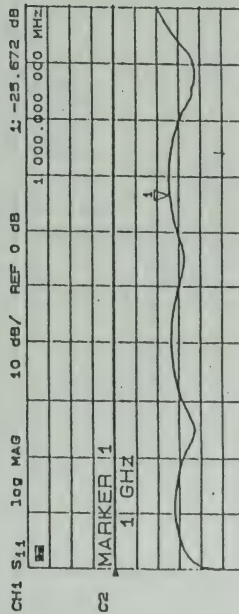


STEP ATT PGAT 6-1248AB

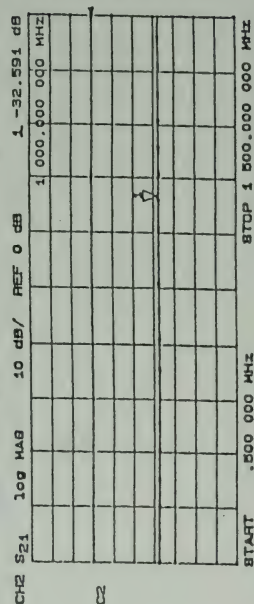
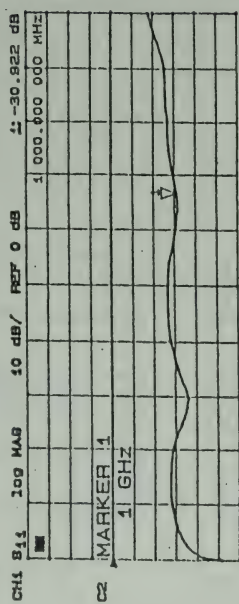
SER NO 241



1 dB



0 dB



32 dB





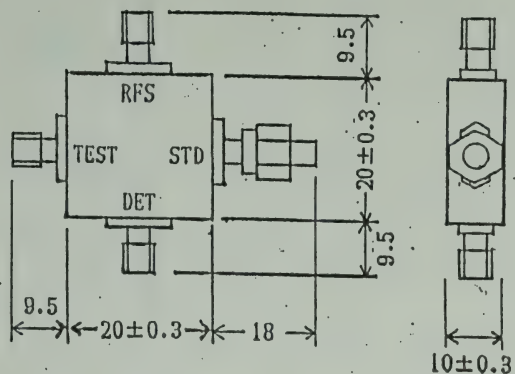
## High Freq. Bridge

## Specification

Type  
Number

HFB-5A

Dimension

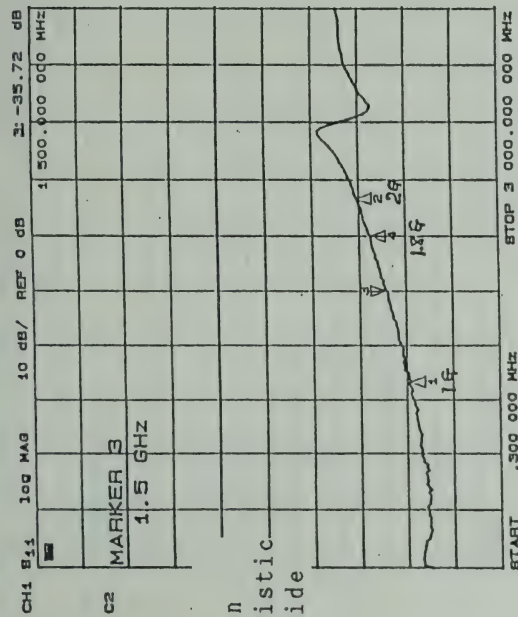


Performance

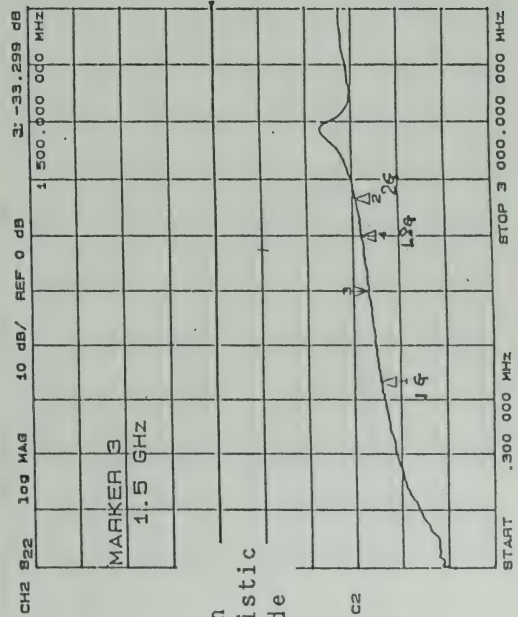
Item	Specification
Frequency	10~2000MHz
Impedance	50Ω
VSWR Range	1.05~
Max. Input Power	20dBm
Coupling Plug	SMA Type



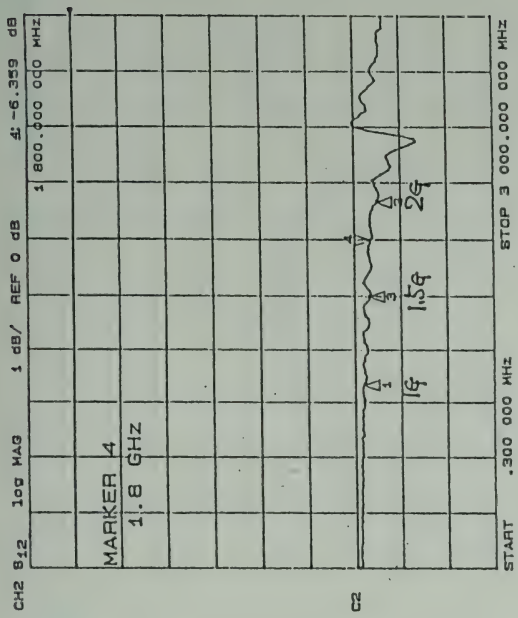




Reflection  
Characteristic  
Test side



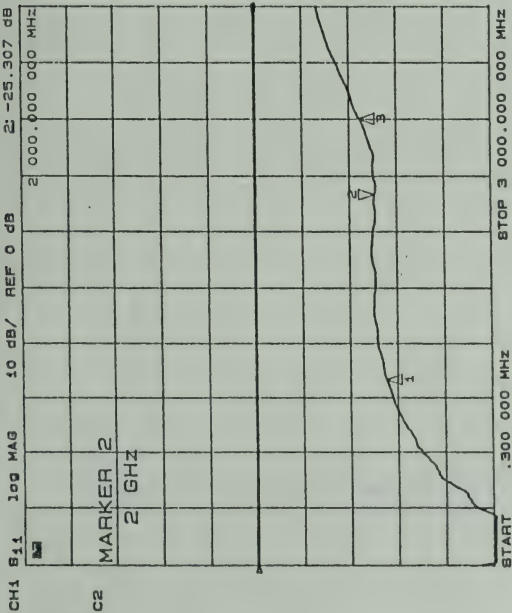
Reflection  
Characteristic  
RFS side



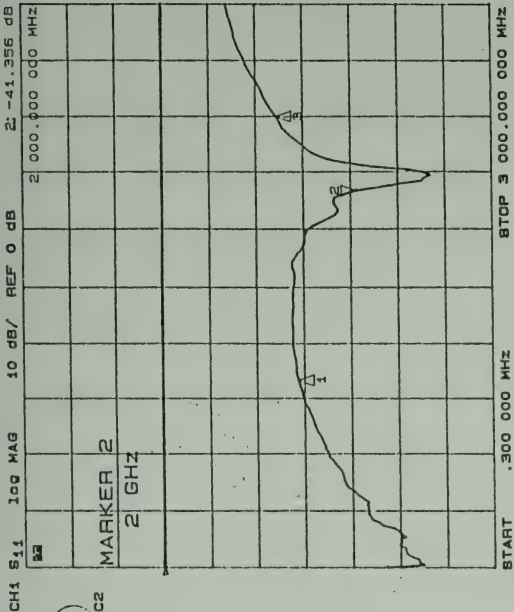
Transfer  
Characteristic  
of RFS side

High Frequency  
Bridge, HFB-5B

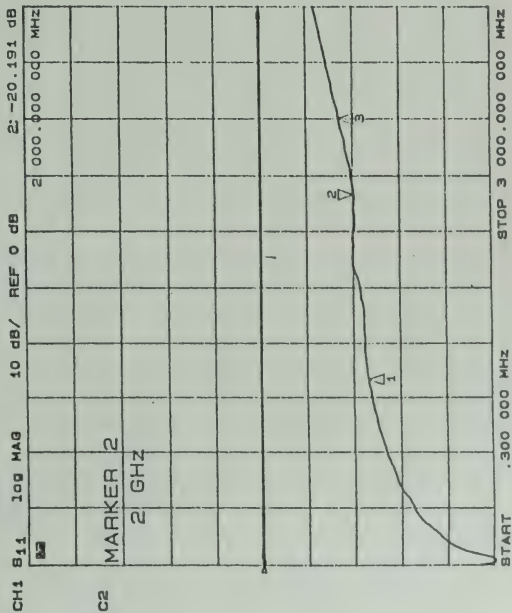




①



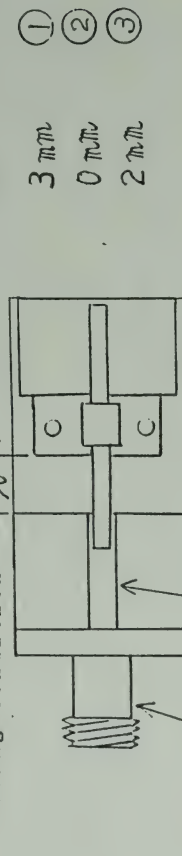
③



②

# High Frequency Power Resistor, DL-21-50 High Frequency Characteristics

Setting Condition  $\rightarrow$   $\lambda$  X dimension Fig. No.



Note) The above characteristics are under jig mounting.  
We recommend to mount this 3mm apart from the end of strip line when using.





H i g h   F r e q u e n c y  
P o w e r   R e s i s t o r  
( D u m m y   L o a d )

S p e c i f i c a t i o n

Hokuriku Electric Industry Co., LTD





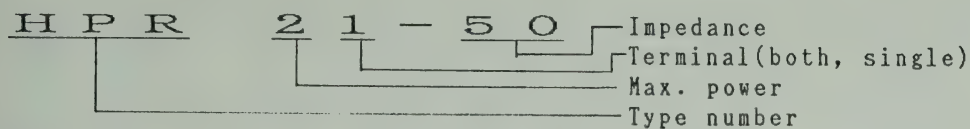
## 1. Application

This specification is applied for high frequency power resistor(dummy load).

## 2. Specification, Dimensions

Table-1 for its specification, Fig-1~5 for its dimensions

## 3. Type number designation



## 4. Marking

- For HPR1 and HPR2, there are marking of max. power, or its code and some codes(manufacturer's name, impedance and manufacturing data code) on it.
- For HPR3 and HPR4, there are marking of type number, max. power, impedance, manufacturer's name and manufacturing data code on it.
- For DL1, DL2, DL3 and DL4, there are marking of max. power code and impedance on it.
- For H-1, H-2 and H-3, there are no marking.

## 5. Usage and precaution

- For single terminal device, its bottom side is GND.  
Please hook it to heat sink with silicon grease for use.
- Please use under the condition of 150°C or below of resistive film temperature.
- When connecting lead pin to strip line, better frequency characteristic can be got by keeping lead 3~5mm longer.
- Since lead pin is hooked up with high temp(309°C) solder, please take it into account when connecting lead pin.
- Please pay attention not to apply force in the direction of peeling-off since lead pin is structurally weak at strength of that direction.



Table-1 High Frequency Power Resistor Specification

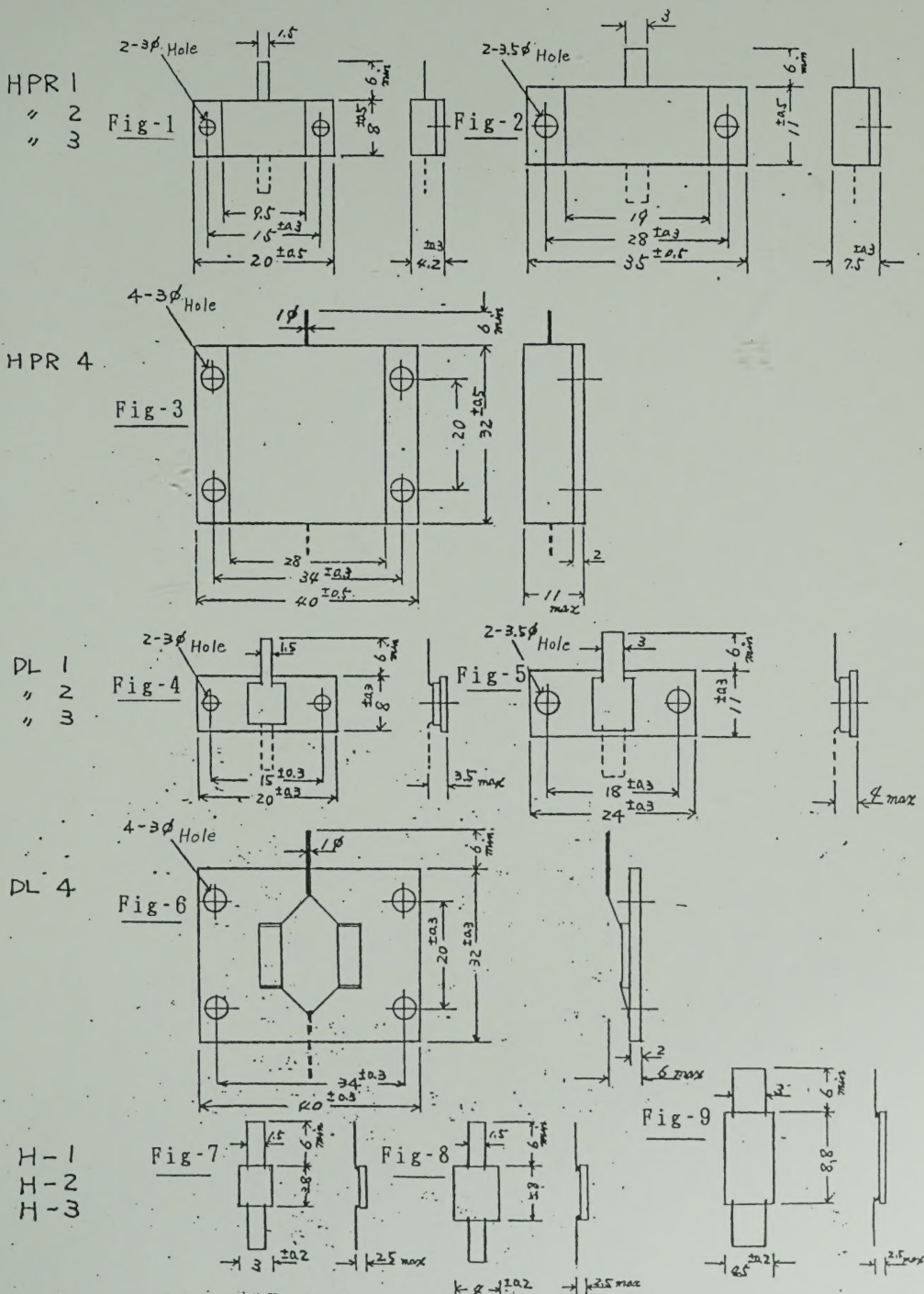
Type Number	Impedance (Ω)	Max. Power (W)	Heat Resistance (°C/W)	Frequency Range (GHz)	VSWR	Operating Temp (°C)	High Temp Storage (%) Load Life	Temp Cycle High Humidity Storage (%)	Dimension (Terminal)
HPR11-	50, 100	10	4.5	DC~1.5	1.2	-55~125	±5	±1	Fig-1 (Both)
HPR12-	50								Fig-1 (Single)
HPR21-	50, 100	30	3.3	DC~1.5	1.2	-55~125	±5	±1	Fig-1 (Both)
HPR22-	50								Fig-1 (Single)
HPR31-	50, 100	50	2.0	DC~1.0	1.2	-55~125	±5	±1	Fig-2 (Both)
HPR32-	50								Fig-2 (Single)
HPR41-	50, 100	100	1.0	DC~0.2	1.2	-55~125	±5	±1	Fig-3 (Both)
HPR42-	50								Fig-3 (Single)
DL11-	50, 100	10	4.5	DC~1.5	1.2	-55~125	±5	±1	Fig-4 (Both)
DL12-	50								Fig-4 (Single)
DL21-	50, 100	30	3.3	DC~1.5	1.2	-55~125	±5	±1	Fig-4 (Both)
DL22-	50								Fig-4 (Single)
DL31-	50, 100	50	2.0	DC~1.0	1.2	-55~125	±5	±1	Fig-5 (Both)
DL32-	50								Fig-5 (Single)
DL41-	50, 100	100	1.0	DC~0.2	1.2	-55~125	±5	±1	Fig-6 (Both)
DL42-	50								Fig-6 (Single)
H-1-	50, 100	5	10	DC~2.0	1.2	-55~125	±5	±1	Fig-7
H-2-	50, 100	10	6	DC~1.5	1.2	-55~125	±5	±1	Fig-8
H-3-	50, 100	20	4	DC~1.0	1.2	-55~125	±5	±1	Fig-9





# High Frequency Power Resistor, Dimensions

Unit : mm









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